CLAIMS

1. An oxynitride phosphor consisting of a crystal containing at least one or more of Group II elements selected from the group consisting of Be, Mg, Ca, Sr, Ba and Zn, at least one or more of Group IV elements selected from the group consisting of C, Si, Ge, Sn, Ti, Zr and Hf, and a rare earth element being an activator, R.

2. The oxynitride phosphor according to claim 1;

wherein said Group II elements in which Ba is essential are one or more selected from the group consisting of Ca, Sr, Ba and Zn and said Group IV elements in which Si is essential are one or more selected from the group consisting of C, Si, Ge, Sn, Ti, Zr and Hf,

wherein said activator R contains Eu.

3. The oxynitride phosphor according to claims 1 or 2;

wherein said Group II element and said activator R are in a molar ratio of 1 : 0.005 to 1 : 0.15.

4. The oxynitride phosphor as in one of claims 1 to 3; containing O and N of which weight ratio is set so that N is within a range of 0.2 to 2.1 per 1 of O.

5. An oxynitride phosphor represented by a general formula of $L_XM_YO_ZN_{((2/3)X+(4/3)Y-(2/3)Z)}$:R (L is at least one or more of Group II elements selected from the group consisting of Be, Mg, Ca, Sr, Ba and Zn. M is at least one or more of Group IV elements selected from the group consisting of C, Si, Ge, Sn, Ti, Zr and Hf. O is an oxygen element. N is a nitrogen element. R is a rare earth element. $0.5 < X < 1.5$, $1.5 < Y < 2.5$, and $1.5 < Z < 2.5$).

6. An oxynitride phosphor represented by a general formula of $L_XM_YQ_TO_ZN_{((2/3)X+(4/3)Y+T-(2/3)Z)}$:R (L is at least one or more of Group II elements selected from the group consisting of Be, Mg, Ca, Sr, Ba and Zn. M is at least one or more of Group IV elements selected from the group consisting of C, Si, Ge, Sn, Ti, Zr and Hf. Q is at least one or more of Group III elements selected from the group consisting of B, Al, Ga and In. O is an oxygen element. N is a nitrogen element. R is a rare earth element. $0.5 < X < 1.5$, $1.5 < Y < 2.5$, $0 < T < 0.5$, and $1.5 < Z < 2.5$).

7. The oxynitride phosphor according to claims 5 or 6;

wherein said L in which Ba is essential are one or more selected from the group consisting of Ca, Sr, Ba and Zn and said M in which Si is essential are one or more selected from the group consisting of C, Si, Ge, Sn, Ti, Zr and Hf,

wherein said activator R contains Eu.

8. The oxynitride phosphor as in one of claims 5 to 7; wherein said X, said Y and said Z are X = 1, Y = 2, and Z = 2.

9. The oxynitride phosphor as in one of claims 5 to 8; of which at least a portion is crystal.

10. The oxynitride phosphor according to claim 9; of which 50 weight % or more is crystal.

11. The oxynitride phosphor as in one of claims 1, 2, 3, 4, 9 and 10; wherein said crystal has a unit lattice of the orthorhombic system.

12. The oxynitride phosphor as in one of claims 9 to 11; wherein 50 weight % or more of said R is Eu.

13. The oxynitride phosphor as in one of claims 1 to 11; wherein 70 weight % or more of said R is Eu.

14. The oxynitride phosphor as in one of claims 1 to 13; which is excited by light from an excitation light source

having a luminescence peak wavelength at 490nm or less, and have luminescence spectra having luminescence peak wavelengths at a longer wavelength side than said luminescence peak wavelength.

15. The oxynitride phosphor as in one of claims 1 to 13; which comprises Ba, Si and Eu and which is excited by light from the excitation light source having a luminescence peak wavelength at 360nm to 480nm, and emits light having luminescence spectra having luminescence peak wavelengths at a longer wavelength side than said luminescence peak wavelength.

16. The oxynitride phosphor as in one of claims 1 to 14; which has a luminescence spectra having a peak wavelength in a range of from blue green to yellow red region.

17. The oxynitride phosphor as in one of claims 1 to 15; which comprises Ba, Si and Eu and has a luminescence spectra having a peak wavelength in a range of from blue green to green region.

18. The oxynitride phosphor as in one of claims 1 to 17; wherein luminescence intensity excited by light of 370nm is higher than luminescence intensity excited by light of 500nm.

19. The oxynitride phosphor as in one of claims 1 to 17; which comprises Ba, Si and Eu,

wherein the luminescence intensity excited by light of about 460nm is higher than luminescence intensity excited by light of about 350nm.

20. The oxynitride phosphor as in one of claims 1 to 18; which has 2 or more of Group II elements selected from the group consisting of Be, Mg, Ca, Sr, Ba and Zn.

21. The oxynitride phosphor as in one of claims 1 to 20; which contains Sr and Ca in a molar ratio of Sr : Ca = 6 : 4 to 9 : 1.

22. The oxynitride phosphor as in one of claims 1 to 20; which contains Sr and Ba in a molar ratio of Sr : Ba = 6 : 4 to 9 : 1.

23. The oxynitride phosphor as in one of claims 1 to 20; which contains Ca and Ba in a molar ratio of Ca : Ba = 6 :4 to 9 :1.

24. The oxynitride phosphor as in one of claims 1 to 23; of which luminescence peak wavelength and color tone are set

by an addition amount of said activator R.

25. The oxynitride phosphor according to claim 24;

Wherein a portion of Group II element is substituted with said activator R in a molar ratio of (a mix amount of said Group II elements and said activator R) : (the amount of said activator R) = 1 : 0.001 to 1 : 0.8.

26. A process for production of an oxynitride phosphor comprising;

a first step of mixing raw materials containing the nitride of L (L is at least one or more of Group II elements selected from the group consisting of Be, Mg, Ca, Sr, Ba and Zn, the nitride of M (M is at least one or more of Group IV elements selected from the group consisting of C, Si, Ge, Sn, Ti, Zr and Hf), the oxide of M, and the oxide of R (R are one or more rare earth elements), and

a second step of firing the mixture obtained in said first step.

27. The process for production of an oxynitride phosphor according to claim 26;

wherein said Group II elements in which Ba is essential are one or more selected from the group consisting of Ca, Sr, Ba and Zn,

wherein said Group IV elements in which Si is essential are one or more selected from the group consisting of C, Si, Ge, Sn, Ti, Zr and Hf,

wherein said rare earth elements contain Eu.

wherein said oxide of R and said nitride of L are in a molar ratio within a range of said nitride of L : said oxide of R = 1 : 0.005 to 1 : 0.15.

28. The process for production of an oxynitride phosphor according to claim 26;

wherein a nitride of R is used in place of said oxide of R, or together with said oxide of R.

29. The process for production of an oxynitride phosphor as in one of claims 26 to 28;

wherein a compound of Q (Q is at least one or more of Group III elements selected from the group consisting of B, Al, Ga and In) is further mixed in said first step.

30. The process for production of an oxynitride phosphor as in one of claims 26 to 29;

wherein said nitride of L, said nitride of M and said oxide of M are adjusted in molar ratios of 0.5 < the nitride of L < 1.5, 0.25 < the nitride of M < 1.75 and 2.25 < the oxide of M < 3.75 in said first step.

31. The process for production of an oxynitride phosphor as in one of claims 26 to 30;

wherein at least a portion of the raw material of said nitride of L is substituted with at least either of the oxide of R and a nitride of R.

32. The oxynitride phosphor produced by the process as in one of claims 26 to 31.

33. A light-emitting device comprising;

an excitation light source and a phosphor converting the wavelength of at least the portion of light from said excitation light source,

wherein an oxynitride phosphor having the luminescence peak wavelength at a blue green to yellow region is contained in said phosphor.

34. A light-emitting device comprising;

an excitation light source of which luminescence wavelength is in a range of a short wavelength region of visible light to ultraviolet, and a phosphor which converts at least a portion of light from said excitation light source,

wherein said phosphor contains an oxynitride phosphor in which Ba is essential, said oxynitride phosphor having the

luminescence peak wavelength at a blue green to green region.

35 The light-emitting device according to claim 33; wherein said oxynitride phosphor is a phosphor as in one of claims 1 to 25, and 32.

36. The light-emitting device as in one of claims 33 to 35; wherein said excitation light source has at least one or more of luminescence peak wavelengths in a range of a short wavelength side region of visible light to ultraviolet.

37. The light-emitting device as in one of claims 33 to 36; wherein said excitation light source is a light-emitting element.

38. The light-emitting device according to claim 37; wherein said light-emitting element has a nitride semiconductor containing In.

39. The light-emitting device as in one of claims 33 to 38; wherein said phosphor includes a second phosphor together with said oxynitride phosphor, said second phosphor carrying out the wavelength conversion of at least a portion of light from said excitation light source and having a luminescence spectrum including one or more peak wavelengths

in visible region.

40. The light-emitting device according to claim 39;

wherein said second phosphor has a luminance spectrum including at least one or more luminescence peak wavelengths from a blue region to red region.

41. The light-emitting device according to claims 39 or 40;

wherein a light selected from the group consisting of (1)a light mixed of a portion of the light from said excitation light source and the light from said oxynitride phosphor, (2)a light mixed of a portion of the light from said excitation light source and the light from said second phosphor, (3)a light mixed the light from said oxynitride phosphor and the light from said second phosphor, (4)a light mixed of a portion of the light from said excitation light source, the light from said oxynitride phosphor and the light from said second phosphor, is output.

42. The light-emitting device as in one of claims 39 to 41;

which has a luminescence color being set at an intermediate luminescence color from the peak wavelength of said excitation light source to the peak wavelength of said oxynitride phosphor or the peak wavelengthof said second phosphor.

43. The light-emitting device according to claim 42; wherein the luminescence color is white color.

44. The light-emitting device as in one of claims 39 to 43; wherein the luminescence spectrum has at least one or more of luminescence peak wavelengths in the ranges consisting of a range of 430 to 500nm and a range of 500 to 730nm.

45. The light-emitting device as in one of claims 31 to 35; wherein said oxynitride phosphor has Ba and Si, wherein the luminescence spectrum has at least one or more luminescence peak wavelengths in the ranges consisting of a range of 360 to 485nm, a range of 485 to 548nm and a range of 548 to 730nm.

46. The light-emitting device as in one of claims 31 to 35; wherein said oxynitride phosphor has Ba and Si, wherein the luminescence spectrum has at least one or more luminescence peak wavelengths in the ranges consisting of a range of 360 to 485nm and a range of 485 to 548nm.

47. The light-emitting device as in one of claims 31 to 35; wherein said oxynitride phosphor has Ba and Si, wherein the average rendering index (Ra) is 80 or more.